Wear Testing of Rubber   SOV/138-58-10-5/10

through skidding. Wear tests under laboratory conditions
and road or service tests have different intensity, parti-
cularly as regards temperature. Table 2 compares contact
pressure, rubbing speed and temperature for a tyre at 30
km/hr with 3% slip with conditions under the GOST 423-57
(Government Standard) test under constant load conditions
on a Grassel test machine. The contact pressure in the
laboratory test is very much lower while the temperature
is much higher. The wear index V_{NU} is not proportional
to the normal load N. However, the product $v\mu$ is propor-
tional to N and is a suitable wear index as has been
proved on tests with N varying from 0.5 to 12 kg/cm^2.
I t   i s   s u g gested that it would be more realistic to
conduct laboratory tests at high contact pressures, but
to reduce the coefficient of friction by using less ab-
rasive test surfaces. Methods using radioactive tracers
Card 3/4   could enable the intensity of laboratory tests to be

Wear Testing of Rubbers   SOV/138-58-10-5/10

brought down to a level which would simulate road tests
more exactly and still retain sensitivity of test.
There are 4 Figures, 2 Tables and 25 References: 13
English, 3 Soviet, 2 French and 2 German

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promysh-
lennosti i Nauchno-issledovatel'skiy institut rezinovoy
promyshlennosti (Scientific-Research Institute of the Tire
Industry and Scientific-Research Institute of the Rubber
Industry)

Card 4/4

REZNIKOVSKIY, M.M.; KHROMOV, M.K.; PANIN, G.F.

Attachment to the MRS-2 apparatus for the automatic detection of
residual deformations during repeated compression. Kauch. i rez. 17
no.3:27-29 Mr '58.   (MIRA 11:6)
          (Rubber--Testing) (Testing machines)

69-20-3-18/24

AUTHORS: Reznikovskiy, M.M.; Priss, L.S.; Khromov, M.K.

TITLE: The Effect of the Composition of Rubber on Its Fatigue Charac-
              teristics (Vliyaniye sostava reziny na yeyë ustalostnyye
              svoystva)

PERIODICAL: Kolloidnyy zhurnal, 1958, vol XX, Nr 3, pp 368-375 (USSR)

ABSTRACT: In tires, shock absorbers, etc rubber is under frequent stress.
              In many other products, like packings, the rubber is under
              continuous static stress. In all these cases the most im-
              portant property of the rubber is fatigue resistance. In the
              article, the fatigue resistance of rubber in relation to type,
              degree of vulcanization, filling, and plastication is studied.
              Natural rubber and the synthetic rubbers SKB and SKS-30, all
              samples without filler and with 40 parts of black per 100
              parts of rubber weight, are tested. The results are given in
              Figure 2. The filling has only a slight influence on the
              fatigue resistance of the rubber. The fatigue characteristics
              in stresses with alternating signs are determined by the rubber.
              Rubber type SKB shows better results than the other types, in-
              cluding natural rubber. The influence of the vulcanization
Card 1/2   degree on the fatigue properties is shown in Figure 4. The

69-20-3-18/24

The Effect of the Composition of Rubber on Its Fatigue Characteristics

fatigue deformation reaches a maximum at a sulfur dose of
1.8%. This dose corresponds to that used in technical rubber.
The influence of the filler content was investigated in SKS-30
vulcanization with doses of 0; 2; 5; 10; 15; 20; 30; 40; 60;
80; amd 100 parts of filler per 100 parts of rubber. Figure 5
shows that the fatigue resistance increases with the black
content in rubber. The degree of plastication also influences
the fatigue properties. Vaseline oil was used as plasticizer.
The fatigue properties reach a maximum at a plasticizer con-
tent of 20 weight parts.
There are 7 graphs, 2 tables, and 5 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti,
Moskva (Scientific Research Institute of the Tire Industry,
Moscow)

SUBMITTED: February 25, 1958

Card 2/2   1. Rubber—Fatigue   2. Rubber—Stresses   3. Rubber—Vulcanization

NOVIKOV, A.S.; REZNIKOVSKIY, M.M.

In the Technical Committee "Rubber." Standartizatsiia 22 no.1:68-69
Ja-F '58.   (MIRA 11:2)
                (Zurich--Rubber--Standards--Congresses)

REZNIKOVSKIY, M.M., Doc Tech Sci -- (diss) "Study of
the dynamic properties of *Rubber*." Mos, 195-, 31 pp

(Mos Inst of Fine Chemical Technology im M.V. Lomonosov)

150 copies. List of author's works, pp 29-30 (25 titles)

(KL, 50-58, 123)

- 48 -

15(9)   SOV/63-4-1-12/31

AUTHOR: Reznikovskiy, M.M., Candidate of Chemical Sciences

TITLE: Mechanical Properties of Rubber Under Conditions of Dynamic
               Load (Mekhanicheskiye svoystva reziny v usloviyakh dinamiche-
               skogo nagruzheniya)

ABSTRACT: In tires. V-belts, shock absorbers, etc the mechanical proper-
               ties of rubbers determine the reliability and operation con-
               ditions of the corresponding machine parts. The investigation
               of the elastic-hysteresis properties and the fatigue-resistance
               properties is therefore very important. The relaxation pro-
               perties of rubbers are determined by the dynamic module of
               elasticity which is the relation of the stress amplitude to the
               deformation amplitude, and by the phase shift between deforma-
               tion and stress. The dynamic hysteresis is the consequence of
               this phase shift. Other indices for hysteresis are the relative
               hysteresis, i.e. the ratio of the mechanical losses to the full
               work of the cycle, and the module of inner friction i.e. doubled
Card 1/4   mechanical losses per unit volume during one loading cycle at

Mechanical Properties of Rubber Under Conditions of Dynamic Load

the unitary value of the dynamic deformation amplitude. For a
qualitative description of the mechanical behavior of a material
with relaxation properties the Maxwell equation is used $\underline{/}$ Ref 41 $\underline{/}$.
An increase in the frequency of dynamic load at constant tempera-
ture affects the elastic-hysteretic properties in the same way
as a reduction of temperature. Frequency and temperature are
interchangeable so that a change of one parameter is accompanied
by a change of the other. The "monomeric viscosity" is con-
nected with the heat extension $\underline{/}$ Ref 59, 60 $\underline{/}$. The dynamic pro-
perties of linear polymers depend on the frequency but most
rubber products operate at low frequencies. For tires 100
cycles is the upper limit. If the deformations do not exceed
15 - 20%, the correlation with the dynamic properties of rubbers
may be expressed in a linear form. The transformation of a
linear polymer into a three-dimensional one during vulcanization
causes a principal change of its behavior under conditions of
elastic equilibrium. The equilibrium module is determined by
the density of the vulcanization net and does not depend on in-
termolecular interaction $\underline{/}$ Ref 54 $\underline{/}$. The inner friction in-
creases, however, with intermolecular interaction. The mole-
cular weight of the polymer has only a slight effect on its

Card 2/4

SOV/63 4 1-12/31

Mechanical Properties of Rubber Under Conditions of Dynamic Load

dynamic properties /Ref 84_7. The active fillers possess a
pronounced thixotropy and the dynamic module as well as the
module of inner friction increase the more sharply, the more
active is the used filler. Low molecular plasticizers have a
considerable effect on the mechanical properties of rubbers.
The introduction of the plasticizer reduces the interaction
between the links of the molecular chains and facilitates their
mutual displacements. Filling leads to a sharp increase of
heat generation if the rubber operates under given deformations.
The increase is lower if the rubber operates under a given
cycle energy. The heat generation decreases if the rubber oper-
ates under given stress conditions. Under conditions of a
symmetric extension compression cycle, deformation amplitude
of 25% and at 100°C the fatigue resistance of natural rubber
is determined by the oxygen content in the surrounding gas
medium. The resistance to the development of primary destruc-
tion seats of the rubber is connected with the chemical re-
sistance. the resistance to the growth of these seats is de-
termined by the physical-mechanical properties of the rubber.
Age resistors are all substances impeding reactions of free-

Card 3/4

SOV/63-4-1-12/31

Mechanical Properties of Rubber Under Conditions of Dynamic Load

radical character.
There are 7 graphs, 1 table and 105 references, 52 of which
are Soviet, 39 English, 5 German, 5 American, 2 French, 1 Cana-
dian and 1 Japanese.

Card 4/4

.5(4)   SOV/69-21-4-14/22

AUTHOR: Reznikovskiy, M.M., Priss, L.S., Khromov, M.K.

TITLE: On the Relation Between the Fatigue Resistance, Strength,
               Hysteresis and Chemical Stability of Rubbers

PERIODICAL: Kolloidnyy zhurnal, 1959, Vol XXI, Nr 4, pp 458-463 (USSR)

ABSTRACT: This is a comparative study of various factors as fatigue
               resistance, tensile strength, hysteresis and chemical stability,
               which determine the working capacity of natural and synthetic
               rubber products. The authors started from the assumption that
               also in the case of constant temperatures and stability of
               the other experimental conditions rubbers with high internal
               friction will be less resistent to dynamic fatigue. In order
               to verify this assumption, they compared the dynamic fatigue
               resistance of various rubbers differing by type, degree of vul-
               canization etc. with the corresponding indices of internal fric-
               tion. The data used for this purpose were taken from . formerly
Card 1/4   published article [reference 5]. The general trend to a di-
               minution of fatigue resistance in dependence on the growth

On the Relation Between the Fatigue Resistance, Strength, Hysteresis and
Chemical Stability of Rubbers

of internal friction is distinctly shown by the curves in graph
5, where the index f_{oy}/P (dynamic fatigue resistance at given
working capacity/tensile strength) was plotted as a function of
the modulus of internal friction for various rubbers. The con-
siderable dispersion of the values is quite natural, as the
compared rubbers do not differ only in internal friction. Such
a dependence also holds for the index $\varepsilon_{oy}/\varepsilon_p$ (fatigue deforma-
tion/ specific elongation), as this relation changes in accor-
dance with f_{oy}/P (graphs 1 and 2). The data in table 1, which
was obtained by the woman graduate student, L. Pevzner, of
MITKHT imeni Lomonosova, permit still more definite conclusions.
The table contains the results of comparative tests with vulca-
nized rubbers prepared on a butadiene styrene basis. The stan-
dard rubber mixture A of the table was varied by increasing
the sulphur doses and reducing the amounts of added filler.
Card 2/4   The variations, however, left nearly intact the values of

SOV/69-21-4-14/22

On the Relation Between the Fatigue Resistance, Strength, Hysteresis and
Chemical Stability of Rubbers

tensile strength and of the dynamic modulus E. In this way
four rubbers were obtained with consecutively decreasing values
for filler content and internal friction modulus K. Testing of
these rubbers, which was carried out under alternating bending
at $100°C$ and a deformation amplitude of 20%, showed a monotonous
increase of their working capacity in dependence on a diminution
of the internal friction modulus. On the basis of the obtained
results, the authors conclude that the experiments fully con-
firm the assumption of an inverse proportion between the inter-
nal friction of rubber and its fatigue resistance. The reduc-
tion of internal friction is also a very efficient method to
increase the working capacity of rubber, as the lower the inter-
nal friction, the lower also the temperature, which develops
in the ready product as a result of hysteresis. In order to
illustrate the dependence of the relative significance of phy-
sical and chemical factors on fatigue conditions, the authors

Card 3/4

SOV/69-21-4-14/22

On the Relation Between the Fatigue Resistance, Strength, Hysteresis and
Chemical Stability of Rubbers

have compiled data for natural polybutadiene rubbers (table 2).
The data shows that aging and a rise in temperature affects
the advantages, which are proper to natural rubber as compared
to polybutadiene products. On the whole, the experiments have
shown, that under identical experimental conditions, rubbers
with great internal friction have a reduced working capacity.
The fatigue resistance of rubbers is the greater the greater
their tensile strength, their chemical stability and the lower
their internal friction. The relative significance of each of
these factors depends on the experimental conditions such as
loading, temperature and surrounding medium. The authors ex-
press their gratitude for help to Professor B.A. Dogadkin.
There are 3 graphs, 2 tables and 8 Soviet references.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti,
Moskva (Scientific Research Institute of the Tire Industry,
Moscow)

SUBMITTED: 25 February, 1958

Card 4/4

15(9)   SOV/2o-128-1-19/58
AUTHORS: Reznikovskiy, M. M., Lukomskaya, A. I.

TITLE: On the Relation Between the Phenomena of Rupture and Tear in
                Rubber

PERIODICAL: Doklady Akademii nauk SSSR, 1959, Vol 126, Nr 1,
                pp 75 - 77 (USSR)

ABSTRACT: In some previous papers (Ref 4) on the "tear" of rubber an
                approximate theory of this phenomenon was developed. It yields
                a quantitative relation between the so-called characteristic
                energy T of tear and the specific energy E of rupture. One of
                the principal errors of this theory is the neglect of the
                statistic nature of strength and of the resultant dependence
                of the latter on the size of the sample under investigation,
                or on the value of the volume to be deformed. However, breaking
                tests exhibit the following special features: Due to artifi-
                cial concentration of tensions, destruction always takes place
                in a definite, minute volume at the end of the increasing cut.
                This is why the results of breaking tests can be compared only
                if the essential difference in the size of the samples under
Card 1/3   investigation is taken into account. The increase in strength

On the Relation Between the Phenomena of Rupture and   SOV/20-128-1-19/58
Tear in Rubber

with decreasing size of the above samples is easily explained
by the statistic theory as less dangerous damages occur in
smaller volumes. This assumption is confirmed by several ex-
perimental data. The approximate method of extrapolating the
qualitative estimation of the true tensions produced at the
end of the cut was employed in an investigation carried out
in the authors' laboratory. Various kinds of samples were sub-
jected to breaking tests. In most cases, the (obviously too
small) values of the desired tension exceeded those obtained
from ordinary breaking tests. The characteristic energy of
tear cannot be ascertained from the random value of the elastic
energy E (resulting from ordinary breaking tests), but from a
certain limit E_0, which corresponds to the minute size of the
volume deformed at the end of the increasing cut. $T = dE_0 =$
$= dkE$ is thus obtained, the coefficient $k = E_0/E$ increases with

the decrease of strength of the rubber under investigation as
a result of random damages or inhomogeneities of the structure.
$k \sim T/E$ is approximately found. This and other facts mentioned

Card 2/3   give a satisfactory confirmation of the respective ideas.

On the Relation Between the Phenomena of Rupture and   SOV/20-128-1-19/58
Tear in Rubber

There are 2 tables and 5 references, 1 of which is Soviet.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti
(Scientific Research Institute for the Tire Industry)

PRESENTED: March 26, 1959, by P. A. Rebinder, Academician

SUBMITTED: March 23, 1959

Card 3/3

S/138/60/000/005/009/012
A051/A029

AUTHOR: Reznikovskiy, M.M.

TITLE: The Friction Between Rubber and Hard Materials

PERIODICAL: Kauchuk i Rezina, 1960, No. 5, pp. 34 - 37

TEXT: The significance of developing a method for increasing the
wear-resistance in tires of automobiles and aircraft is stressed. The
phenomenon of friction in soft, not completely elastic material (in this
case rubber), against a hard rough surface is studied here. The main point
in the study is the fact that the local deformations, to which the rubber
is subjected, are completely elastic. Since the model must explain the
occurrence of friction forces, no specific surface "friction forces" are
taken into consideration. In order to analyze the phenomenon of friction,
the author makes several assumptions, using as his model the surface of a
hard body represented by a relatively regular system of alternating cavit-
ies and humps and a rubber sample sliding along this surface (Figure 1).
The assumptions are confirmed mathematically, using Kelvin's formula for a
tensile-elastic medium. Equation (5) confirms the experimental data ob-

Card 1/2

The Friction Between Rubber and Hard Materials

S/138/60/000/005/009/012
A051/A029

tained on the relationship between velocity and time of the moving force in sliding and vibrational friction. The investigation of the relationship between the friction coefficient of rubber along/a hard rough support and the indices characterizing its tensile-elastic\properties is of special interest. The friction coefficient on steel depends on the main factors determining qualitatively the rubber composition as well as the coefficient of resistance to vibration of the rubber roller on the freely rotating steel roller, pressed onto its surface. On the whole, the experimental material gathered agrees favorably with the original assumptions made, concerning the effect of the composition on the friction coefficient of rubber on steel, and as to its tensile-elastic properties. All the facts given about the elastic-hysteretic nature of the external friction of rubber only show the main factors in the region of friction of the rubber on a hard rough surface can be qualitatively explained by a purely mechanical viewpoint as incomplete deformations in a sliding contact. There are 1 diagram, 2 figures, 1 table and 15 references: 11 Soviet and 4 English.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry)

Card 2/2

S/138/60/000/005/012/012
A051/A029

AUTHOR: Reznikovskiy, M.M.

TITLE: The All-Union Conference of Instrument Designing for Physico-
            Mechanical Rubber Tests (Chronicle)

PERIODICAL: Kauchuk i Rezina, 1960, No. 5, pp. 55 - 56

TEXT: The Vsesoyuznoye soveschchaniye po voprosam priborostroyeniya
dlya fiziko-mekhanicheskikh ispytaniy kauchuka i reziny (All-Union Con-
ference on Instrument Designing for Physico-Mechanical Testing of Rubber)
took place on March 3 - 7, 1960 in Leningrad. It was convened by the Board
for Tires and Rubber Articles of the State Committee on Chemistry in the
USSR Council of Ministers, the Board of the Chemical Industry of the Lenin-
grad Council of National Economy and the Rubber Section of the VKhO im.
Mendeleyev. G.P. Trunov, head engineer of the Chemical Board of the Lensov-
narkhoz stressed the aims of the conference as being the development of
specific recommendations for fulfilling the 1960 - 65 plan of the Rubber
Instrument Designing Department. The following papers were presented:
M.M. Reznikovskiy, (NIIShP): "The State and Problems Encountered in Deve-

Card 1/3

S/138/60/000/005/012/012
A051/A029

The All-Union Conference of Instrument Designing for Physico-Mechanical
Rubber Tests (Chronicle)

loping, Perfecting and Unifying the Physico-Mechanical Methods for Rubber
Testing"; E.P. Goloskov ("Metallist" Plant): "The Work of the "Metallist"
Plant in the Field of Designing and Manufacturing Laboratory Equipment
and Instruments for Physico-Mechanical Rubber Testing in 1959 - 65": S.A.
Ivanova (NIIShP), D.L. Fedyukin (NIIR), V.V. Ovchinnikov (NIIRP), M.I.
Yegorova (VIAM), A.I. Marey (VNIISK), V.A. Lepetov (MITKhT im. Lomonosov)
and others read papers on the results of research carried out on the desig-
ning and perfecting of new testing instruments. A special exhibition of
instruments was on display. Some of the instruments were: A micro-hardness-
-meter (VIAM), the ИМИ-3 (IMI-3) instrument for testing rubber against
friction (NIIShP), the "vulkameter" for testing the vulcanization optimum
(NIIR), an instrument for determining the adhesiveness of rubber mixtures
and adhesives (NIIShP) etc; The viscosimeter BP-2 (VR-2) manufactured by
the "Metallist" Plant attracted special interest also the "condensometer"
for checking plasticity and vulcanizability, a globular hardness gage, an
elasticity testing instrument to be used at temperatures of 20 to 250°C,

Card 2/3

S/138/60/000/005/012/012
A051/A029

The All-Union Conference of Instrument Designing for Physico-Mechanical
Rubber Tests (Chronicle)

a dynamic test instrument (ZPI), instruments for testing elastic proper-
ties of foam rubber, etc. Foreign instruments were also shown. The main
problems encountered in this field were determined as follows: 1) Moderni-
zing instruments for extension testing, strength measurements, automation
of elongation measurements and thermostat control within a wide range of
temperatures. 2) Introduction of small-size instruments for crack detec-
tion and hardness tests. 3) Modernization of instruments used for deter-
mination of mechanical indices within a wider measuring temperature range.
4) Recommendations of more effective methods for high-speed control of
rubber mixtures. 5) Modernization and introduction of new apparatus for
testing of various forms of aging. 6) Increasing the productivity of the
instruments intended for mass testing, automation of the prime operations
and analyzing the results of the measurements. 7) Extension of research
on the study of the mechanical properties of elastomers and introduction
of physical testing methods for complex indices, such as dynamic elasticity
and hysteresis, wear-resistance, etc. The conference noted the unsatis-
factory state of the standards and suggested their systematic revision

Card 3/3

KHROMOV, M.K.; PRISS, L.S.; REZNIKOVSKIY, M.M.

Further investigation of methodological problems concerning rubber fatigue tests. Trudy Nauch.-issl. inst. shin. prom. no.7:5-20 '60.   (MIRA 14:8)

(Rubber—Testing)

BRODSKIY, G.I.; MEREZHANNYY, S.B.; REZNIKOVSKIY, M.M.; SAKHNOVSKIY, N.L.

Evaluation of service life of protective rubbers.   Trudy Nauch.-
issl. inst. shin. prom. no.7:78-90 '60.   (MIRA 14:8)
                    (Rubber--Testing)

S/081/61/000/022/075/076
B144/B138

AUTHORS: Khromov, M. K., Reznikovskiy, M. M.

TITLE: Tensile testing of rubbers at temperatures of up to 300°C

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 22, 1961, 484 - 485,
abstract 22P292 (Tr. N.-i. in-ta shin. prom-sti, sb. 7, 1960,
119 - 130)

TEXT: An apparatus is described for the tensile testing of rubbers at up
to 300°C. It consists of a new heating chamber with a PMM-30A (RMM-30A)
tensile tester connected to it. The samples are put into the chamber
with special grips and extracted by means of a rail conveyer and push rod.
This makes the apparatus easy to operate. To eliminate the possibility
of the rubber creeping out of the clamps special spoon-shaped samples
are used with additional lugs, and self-tensioning clamps. Two methods
of measuring deformation on this kind of specimen are elaborated. In the
first deformation occurring in the test length of the sample is found by
the difference between total deformation and than in the non-uniform part

Card 1/2

Tensile testing of rubbers ...

S/081/61/000/022/075/076
B144/B138

of the rest of the piece. This is determined from the displacement of a
mark. In the second method, deformation is found from the functional
dependence of the deformation in the test length on the displacement of
the grips. The change in the strength characteristics of filled breaker
strip rubbers from HK (NK), CKБ (SKB), CKИ (SKI), CKC-30APM (SKS-30ARM),
"Nairit", and CKH-26 (SKN-26) was found at 25 - 300°C by using the new
apparatus. [Abstracter's note: Complete translation.]

S/081/61/000/023/057/061
B106/B101

AUTHORS: Antonova, Ye. A., Ivanova. S. A., Reznikovskiy, M. M.,
              Timofeyeva, M. V.

TITLE: Rubber aging test in an inert gas atmosphere

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 23, 1961, 561, abstract
              23P353 (Tr. N.-i. in-ta shin. prom-sti, sb. 7, 1960, 131-134)

TEXT: A device and technique for aging rubbers under exclusion of air are
described. The samples are aged in a hermetically sealed thin-walled
cylindrical steel vessel filled with an inert gas and installed in an
ultrathermostat. The tests may be carried out at temperatures up to 200°C
and pressures between normal and 7 at. Rubbers prepared from HK(NK) re-
tain their properties satisfactorily after aging 96 hr at 130°C in N_2 and
Ar, whereas they practically become completely useless after 12 hr in air.
[Abstracter's note: Complete translation.]

Card 1/1

S/081/61/000/023/058/061
B106/B101

AUTHORS: Reznikovskiy, M.M., Zverev, N.P., Denisova, L.L.

TITLE: An improved chamber for laboratory tests of the ozone
               resistance of rubbers

PERIODICAL: Re-rativnyy zhurnal. Khimiya, no. 23, 1961, 561, abstract
               23 P 354. (Tr. N.-i. in-ta shin. prom-sti, sb. 7, 1960, 135-139)

TEXT: An installation guaranteeing satisfactory accuracy and reproducibility
of measurements even at nonuniform O_3 distribution in the working chamber is
described. In order to exclude fluctuations in the O_3 concentration, the
case containing the samples revolves at a rate of 2 rpm. The contactless
transmission of torque from the Warren motor is attained by means of a mag-
netic clutch. [Abstracter's note: Complete translation.]

Card 1/1

S/081/61/000/019/082/085
B103/B147

AUTHORS: Lukomskaya, A. I., Reznikovskiy, M. M., Orlovskiy, P. N.,
                Stukalova, A. F.

TITLE: Efficient laboratory method for determining vulcanization of
                rubber mixtures before due time

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 19, 1961, 523, abstract
                19P315 (Tr. N.-i. in-ta shin. prom-sti, sb. 7, 1960, 154-167)

TEXT: To find the most efficient method of determining the scorching
capacity of rubber mixtures, the authors compared the characteristics of
the most usual laboratory methods with those characterizing the behavior
of mixtures directly during the technological processing. Scorching is
essentially affected by the following factors acting during the preheating
of mixtures: deformation, its amount, rate, and periodicity; temperature
and its duration; medium of preheating; volume of the prepared mixture to
be preheated. It is most convenient to determine the scorching capacity
of rubber mixtures by means of shift plastometers. [Abstracter's note:
Complete translation.]

Card 1/1

5/1 /00/000/00 /
A051/A029

AUTHORS: Brodskiy, G.I.; Sakhnovskiy, N.L.; Reznikovskiy, M.M.; Yevstratov,
V.F.

TITLE: Mechanical and Thermochemical Destruction in the Wear of Rubber Under
Various Conditions

PERIODICAL. Kauchuk i Rezina, 1960, No. 8, pp. 22 - 29

TEXT: Brief reference is made to the previous theories on the wear mechanism
of rubber described in Refs. 1 - 10. It was found that the relative role of the
mechanical and chemical factors in the wear mechanism of rubber depends on the test-
ing conditions. On smooth surfaces with a low thermal conductivity the wear-out in
rubber takes place primarily according to the mechanism of thermooxidizing destruc-
tion. On rough surfaces it takes place mainly according to the mechanism of me-
chanical wear-out. The experiments were conducted on a НИИШП ИМИ1 (NIIShP IMI-1)
Dunlop-Lamburne- type machine. The various types of abrasive surfaces selected for
the study were: a smooth tin plate, smooth plexiglas, a steel plate with specially
cut-out grooves on its surface, (the carbon black dosage was 50 weight parts to
100 weight parts of rubber), a plastic (vinyplast) plate, also with grooves, a
Monocorund 150 polishing skin and a 4-mm plate of hard rubber (hardness = 84, a -
Card 1/3

S/138/60/000/008/006/015
A051/A029

Mechanical and Thermochemical Destruction in the Wear of Rubber Under Various Conditions

cording to shore). It was shown that the braking force F depends comparatively
little on the nature of the wearing-out surface and the composition of the rubber.
The wear intensity evaluated from the volume loss per min. changes more signifi-
cantly. It is deducted the wear index v, depends on the nature of the surface and
the nature of the surface material just as much as the wear intensity, and is
characteristic only for a given friction couple. The investigated materials of the
abrasive surfaces fell in the following sequence according to increase in wear in-
tensity: tin < plexiglas < rubber < grooved plastic < grooved steel < Monocorund 150.
The wear from a metal surface takes place at considerably lower temperatures than
from materials with less thermal conductivity. It is also noted that the wear on
rough uneven surfaces is primarily mechanical. It is further shown that the air
oxygen has a substantial effect on the wear of rubber. The effect of the medium
on the abrasion increases with a decrease of the abrasiveness of the abrasive coat-
ing and with an increase in testing temperature. Tread rubbers based on various
raw materials: natural rubber, sodium-butadiene $CKБ$ -50 (SKB-50), butadiene-styrene
CKC -30APКМ (SKS-30ARKM), carboxylic CKC-30-1 (SKS-30-1) chloroprene, nitrile
CKH -26 (SKN-26), etc., were selected for the study of the effect of oxygen and

Card 2/ 3

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S/138/60/000/009/006/012
A051/A133

/5.9300

AUTHOR: Reznikovskiy, M.M.

TITLE: The connection between the wear-resistance and other mechanical
               properties of rubber

PERIODICAL: Kauchuk i rezina, no. 9, 1960, 33 - 37

TEXT: In previous works (Refs 1 - 4, Viehman, Zapp, Ratner, Shallamakh),
a quantitative connection between the wear-resistance of rubber and its other
mechanical properties, such as hardness, elasticity, rupture resistance and tear
resistance was shown to exist. However, all the quantitative connections cited
until now have not proved universal enough for all rubber grades when checked in
practice. Reference is made to the works of Shallamakh (Ref. 4) as being the
closest to investigating the destruction of rubber when the latter interacts with
a hard protrusion implanted in its surface and moving parallel to its abrasion
surface. The deficiency of Shallamakh's work is the fact that the abrasive
strength rubber was determined on the basis of its strength characteristics dur-
ing single loads, while, generally, abrasive destruction is usually caused by re-
peated chemical actions, as well as by high temperatures, occuring in the slid-
ing contact. The wear of rubber was investigated by the author, making allowance

Card 1/6

S/138/60/000/009/006/012
A051/A133

The connection between the wear-resistance ....

for the fatigue and the friction mechanism (Ref. 7). The wear resistance coeffi-
cient β is taken as the main characteristic and is determined as the work of the
friction forces spent in the wear of a volume unit of the tested rubber. The fol-
lowing formula was derived: $\beta = \dfrac{1}{\alpha} = \dfrac{A}{\Delta V}$ (1), where A is the work of the friction
forces ΔV- the volume change of the specimen as a result of wear.
Under the condition that the surface layer of the rubber, fatigued and destroyed
at a given friction, has a certain effective thickness δ (Fig. 1), depending on
the properties of the rubber and testing conditions, $\Delta V = \nu \cdot \delta \cdot s$ (2), where s is
the nominal area of contact of the friction bodies. ν- the number of surface lay-
ers, under abrasion during the test. The work of friction can then be determined
as $A = \mu \cdot N \cdot 1$ (3), where μ is the friction coefficient N - the normal load. 1 -
the length of the total friction path. And $1 = z \cdot n \cdot \nu$ (4) where z is the average
distance between the neighboring protrusions, and n- the fatigue resistance caus-
ing destruction and separation of the rubber of the surface layer under the given
conditions. Thus, equation (3) can be expressed as: $A = \mu \cdot n \cdot z \cdot N \cdot \nu = q \cdot n \cdot \nu$ (5)
where q is the friction work, corresponding to one load cycle of the surface layer
or the work of the friction force on the path, equal to the average distance be-
tween neighboring protrusions of the hard rough surface in the direction of fric-
tion. The wear resistance coefficient of the rubber, from relations (2) and (5)

Card 2/8

... connection between the wear-resistance ...

S/130/60, 000/009/000/010
A051/A133

can be expressed: $\beta = \dfrac{q \cdot n}{s}$ (6). The latter expression can be simplified if (q')- the index of the specific friction work in one cycle is introduced, determined as the ratio of the friction work on the path equivilant to one load cycle of the surface layer elements and the volume of the deformed layer V. The average thickness of the deformed layer δ' is proportional to the average thickness of the destroyed layer δ ($\delta' = k\delta$), as the first approximation, and the proportionality coefficient k is infinite, and not dependent on the testing conditions and the rubber properties, thus: $V = k \cdot \delta' \cdot S$ (7), and therefore the expression for β can be written as $\beta = \dfrac{q'V \cdot n}{\delta' \cdot s} = k'q' \cdot n$ (8). The latter equation shows that the wear resistance coefficient is proportional to the product of the specific value of the mechanical losses of the elementary load cycle, by the fatigue resistance of the rubber under the given testing conditions. It is further considered that the number of cycles n, prior to destruction depends not only on the value of local deformations of the surface layer, but also, to a great extent, on the temperature, developed in the sliding contact. The latter is determined from the ratio of the specific friction work per cycle (q') to the sliding surface. The author tries to find the relation between the wear resist- ance of the rubber and some of its other properties in a more distinct form, re- ferring to (2) and (5): $\beta = \dfrac{\mu n \cdot z \cdot N}{\delta \cdot s}$ (9). Taking the Poisson coefficient for rub-

Card 3/8

The connection between the wear-resistance ...

ber to be equal to 0.5, and disregarding the deformity of the solid bearing then: $h = 0.68E^{-2/3} \cdot p^{2/3} \cdot r^{-1/3}$ (10), where h is the depth of penetration, E- the Young Modulus of rubber, p- load on the protrusion, r- the radius of the protrusion curvature. In the first approximation it is taken that $P = \frac{N}{s} \cdot z^2$ (11). Characterizing the roughness by the ratio of the area of the single protrusion to the square of the distance between the protrusions $\pi r^2/z^2$, and using the relations (9), (10) and (11) the formula $\beta = \frac{n}{2.14k'} \cdot E^{\frac{2}{3}} \cdot \left(\frac{N}{s}\right)^{\frac{1}{3}} \cdot \left(\frac{z}{r}\right)^{\frac{5}{3}}$ (12) is obtained, where the infinite coefficient k' is considered to be independent of the rubber properties and testing conditions only in the first approximation, requiring special experimental confirmation. The empirical relationship $n = \left(\frac{z_0}{\sigma}\right)^b$ (13) is used to

determine the meaning of the value of n, where δ_0 is the rubber strength under a single load, δ - amplitude value of repeated dynamic stresses, b - infinite coefficient (which is the greater, the higher the fatigue resistance of the rubber). If it is accepted that the amplitude value of the stress is proportional to the greatest pressure, occurring when the hard spherical protrusion is compressed, then $\sigma = k'' \cdot p^{\frac{1}{3}} \cdot E^{\frac{2}{3}} \cdot r^{-\frac{2}{3}}$ (14), where k" is the infinite coefficient, not dependent on the rubber properties and testing conditions. If the value p from (11) is

Card 4/8

connection between the wear-resistance....

S/138/60/000/009/006/012
A051/A133

...stituted in (14), then: $s = k'' \left(\frac{N}{s}\right)^{\frac{1}{3}} \cdot E^{\frac{2}{3}} \cdot \left(\frac{r}{z}\right)^{-\frac{2}{3}}$ (15). Thus, the expression for fatigue (13) can be rewritten as:

$$n = \left[\cfrac{z_0}{k'' \left(\frac{N}{s}\right)^{\frac{1}{3}} \cdot E^{\frac{2}{3}} \cdot \left(\frac{r}{z}\right)^{-\frac{2}{3}}}\right]^{b}$$ (16)

This derived expression excludes the indefinite expression of the fatigue resistance n from equation (12) and can be written as: $s = K \mu \left(\frac{c_0}{k''}\right)^{b} \cdot E^{\frac{2}{3}(1-b)} \cdot \left(\frac{N}{s}\right)^{\frac{1}{3}(1-b)} \times$

$\times \left(\frac{z}{r}\right)^{\frac{1}{3}(5-2b)}$ (17). In (17), K (=2.14 k') and k'' are infinite constants, not dependent in the given approximation on the testing conditions and rubber properties. (17) in the approximately quantitive form, establishes a relationship of the wear-resistance coefficient to the main parameters, characterizing the properties of the friction pair and the testing conditions. (17) also shows that, all previous conditions being equal, the ratio of the wear-resistance coefficient s to the friction coefficient μ should depend on the compression force N according to the equation: $\frac{s}{\mu} = \text{const.} N^{\frac{1}{3}(1-b)}$ (18). It is pointed out that the latter equation contradicts the assumption that the product $\alpha\mu$ should not depend on the

Card 5/8

The connection between the wear-resistance....

S/138/60/000/009/006/012
A051/A133

normal load (Ref. 11, Ratner. Figure 2 shows that the ratio β/μ , when N changes, does not remain completely constant, whereby the relationship $\lg(\beta/\mu)$ to $\lg N$, according to (17), becomes approximately linear. Figure 3 shows the data obtained from the wear of rubber, based on various raw materials. The values of b, calculated experimentally (Figs. 2, 3), correspond in sign and order to the values obtained previously (Refs. 9, 10), when testing the fatigue properties of rubbers. From theoretical and experimental calculations it is thus concluded that the wear of rubber is a consequence of the aging of the surface layer in repeated variable cyclic deformations in the contact zone with the rough surface of the abrasive. There are 3 figures and 12 references: 8 Soviet-bloc and 4 non-Soviet-bloc. The four references to English-language publications read as follows: W. Viehman, Rubb. Chem. Technol., 19, No. 2, 355, 1956; R.L. Zapp, Rubb. World, 133, No. 1, 59 (1955); S.D. Gehman, C.S. Wilkinson, K.D. Daniels, Rubb. Chem. Technol., 28, No. 2, 508 (1955); R. Schnurman, E. Warlow-Davies, Proc. Phys. soc., 54, 301, 14 (1942).

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scien-
tific Research Institute of the Tire Industry)

Card 6/8 .

REZNIKOVSKIY, M.M.; BRODSKIY, G.I.

Frictional wear of rubber on relatively smooth surfaces. Kauch.i
rez. 20 no.7:18-23 Jl '61.   (MIRA 14:6)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
          (Rubber—Testing)   (Friction)

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S/138/60/000/010/006/008
A051/A029

AUTHOR: Reznikovskiy, M.M.

TITLE: Problems of the Development of Instrument Design for Mechanical
              Testing of Raw and Processed Rubbers

PERIODICAL: Kauchuk i Rezina, 1960, No. 10, pp. 34-43

TEXT: The author lists the required properties of instruments used in
the mechanical testing of rubber connected with the factors of mechanical
behavior of the respective materials, such as: 1) capability of large deforma-
tions under the impact of small forces, 2) high sensitivity of the properties
to temperature, 3) high dependence on the speed of force, 4) significant role
of the mechanical impacts prior to the testing, 5) dependence of the mechanical
properties on a number of non-mechanical factors causing chemical changes in
the polymer (light, oxygen, ozone, etc). The author points out that most of
the ГОСТ (GOST) standard testing methods used in the USSR are outdated and this
also applies to certain non-standardized methods. An evaluation is given on
instruments and methods for mechanical testing of rubber and raw mixtures used
at the present time in the USSR. The author divides his summary into 4 parts:
1) the static testing of rubber, 2) dynamic testing of rubber, 3) testing for

Card 1/ 12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw
and Processed Rubbers

wear-resistance, 4) testing of raw rubbers and mixtures. In static testing the
significance of micro-samples, as opposed to standard sizes, is increasing with
régard to determining the tensile strength of rubber. The latter method has
not been sufficiently developed in the USSR. The tear-resistance test (GOST-
262-53) coinciding with the ИCO (ISO) (International Organization for Standards)
has the drawback of giving only a relative indication of this property which is
not characteristic of the material (Ref. 3). Theoretical work is being conducted
for producing a new tear-resistance test method. The strength of adhesion tests
(GOST 768-53, 264-53, 205-41, 410-41, 411-41) are widely used, but the jump-
type changes of the lamination force can be objectively measured only with
inertia-free force measuring apparatus. The shortcomings of the rupture-test-
ing machines manufactured in the USSR are given as being: inaccurate, cumber-
some and subjective measurements of deformations using hand indices, incomplete-
ness of the applied pendular force-measuring device with insufficient hardness
and inertia. The range of measured loads can be increased by using electronic
equipment. Successful automation of measurements and recording of elongations

Card 2/ 12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of
Raw and Processed Rubbers

has not been accomplished in the USSR or abroad. The importance of developing
this technique is emphasized. It is suggested to start mass production of
rupture-testing machines applicable to high and low temperatures. For the
hardness test it is recommended that the presently used TM-2 (TM-2) and TШM-2
(TShM-2) (GOST 253-53) apparatus be modernized to comply with the ISO recommend-
ations. The mass production of hardness-testing machines with thermostats is
recommended. Tests using micro-hardness gages are similar to those on the
TShM-2 machine, but measure only small shifts occurring when a spherical in-
dentor is submerged into the sample being tested. In designing an apparatus
for this test it is suggested that the principles given in Ref. 12 be applied
which have certain advantages over foreign-manufactured instruments of this
kind. The elastic properties in equilibrium should be determined under condi-
tions of expansion, which insures uniformity of the tense state in the working
part of the sample. It is hereby stated that no instrument exists in the USSR
for this type of test. Relaxometers for relaxation of tension testing are
recommended for industrial production, both for compression and expansion at
various temperatures and different gaseous meda. The mass production of heat-

Card 3/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw and Processed Rubbers

ing chambers used in testing creep in expansion has begun. Standardizing this form of test in the near future is suggested. It is pointed out that no GOST exists for the residual compression test. The author recommends introducing a standardized method based on the ISO indications. Proper apparatus for testing elastic-hysteretic properties is said to be absent in industrial laboratories of the USSR. The only method in this group is the GOST 6950-54 for elasticity determination in resilient recoiling, but the latter test gives only a relative evaluation of the elasticity and does not aid in determining the dynamic modulus of the rubber. The НИИШП- (NIIShP) instrument (Ref. 20), which in the near future will be mass-produced is considered to be the best for the impact expansion test and with sufficiently accurate measurements of de-formation. The Aleksandrov, Lazurkin and Gayev vibrators (Ref. 25) are widely used in the USSR for determining the dynamic compression modulus at various temperatures as well as the Kornfeld instrument (Ref. 26) having a stroboscopic attachment for measuring the shift angle of the phases between tension and deformation. The mass-production of an improved instrument for testing under

Card 4/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw and Processed Rubbers

conditions of a sinusoidal load at varying frequencies and temperatures is required. Replacing the mechanical vibrators by electromagnetic ones and the use of electronic equipment for measuring forces and shifts would insure a higher accuracy of measurements and increase the working frequency range. The equipment described could be successfully used for dynamic testing of tire rubber. Mass-production of two simple and original instruments with a rotational transmission of the deformation force to the sample combined with the direct determination of mechanical losses according to the torsional moment on the motor roller (motor-weights system) has begun. They are used for tire rubber testing under conditions of vibrations of ring-shaped samples (ПК-4) (PK-4) and for dynamic testing of rubber by the bending method with rotation (ЗПИ) (ZPI) respectively. Descriptions are given in Refs. 27 and 28 by the author. The instrument and methods used for fatigue resistance testing are classified according to the time element of loading (sine and pulse curves) and according to the test method used. Among parameters affecting the fatigue resistance of the rubber, the non-mechanical ones should also be considered in addition to the purely mechanical parameters. Testing of samples for fatigue

Card 5/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw
and Processed Rubbers

resistance with specially formed sections of concentration against incidental
concentrations of tension is widely performed. The existing GOST for fatigue
resistance testing, such as the GOST 260-53, 261-53, 422-41, are to be review-
ed as they do not comply with the necessary conditions. The "Metallist" Plant
manufactures the MPC -2 (MRS-2) machine most frequently used for the latter
test, since it is the most universal type applicable to expansion, compression,
sign-changing cycles, flexure, etc. The disadvantage of the machine is the
fact that the test can only be carried out under conditions of given shifts and
at a constant temperature of the surrounding medium. The test for evaluating
the resistance to the occurrence and growth of fatigue cracks by the repeated
flexure of special samples with a transverse groove is suggested as being more
effective if the test is performed on samples with zig-zag type grooves rather
than straight ones. Special attention has been drawn to the fact that due to
the relaxation nature of the elasticity of rubber the sign-constant cycle
inevitably leads to a dynamic wearing-out of the tested sample and thus to a
change of the dynamic conditions during the testing process which hinders the
interpretation of results. It is recommended to perform the tests at a
Card 6/12

S/138/60/000/010/006/008
A051/A029

Prcblems of the Development of Instrument Design for Mechanical Testing of Raw
and Processed Rubbers

symmetrical and sign-changing cycle to avoid the difficulty. The most perfect-
ed instrument for fatigue testing in the USSR is at the present time the ZPI
(Fig. 3) on a СЗПИ (SZPI) stand (Fig. 4). There is only one standardized method
for wear-resistance testing in the USSR, the GOST 426-57, and only one mass-
produced machine for this purpose, the МИ -2 (MI-2). The best results of this
test were obtained in tire rubber testing by using the conditions of the vibra-
tions of a ring-shaped sample with various slipping through, relative to the
abrasive surface. The ИМИ-3 (IMI-3) machine is in the experimental stage
(Ref. 38) and has the advantage of being able to test various conditions and
renewing the abrasive surface. It has an independent thermostatic control of
the sample and the wearing-out surface of the abrasive drum. It is recommend-
ed that the IMI-3 be mass-produced and a rational selection of abrasive materi-
als be made, in order to elevate the practical significance of the laboratory
wear-resistance tests. The plasto-elastic properties of rubber are tested in
the USSR according to the GOST 415-53 using the simplified compression plasto-
meter and tests for pliability are carried out on a penetrometer, according to

Card 7/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw
and Processed Rubbers

GOST 416-41. The BP-2 (VR-2) compression plastometer instrument has recently
been put into production. It has been used for solving most industrial control
problems. The so-called conditionmeters for high-speed control operating on
the principle of compression plastometers have just recently been put into mass-
production (Ref. 41). The vulcanization optimum at a given temperature is
determined according to GOST 270-53 derived from a set of tests on various
rubbers. The vulcameter, now used more widely for the latter test, is shown in
Fig. 5. It is stated that there is no given method for determining the adhesive
properties of the rubber in the USSR or abroad. The evaluation of adhesiveness
according to lamination resistance, determined on tensility apparatus with a
pendular force-measuring device, is inaccurate due to distortions caused by
inertia effects. The instrument for this purpose developed by Khromov (Ref. 45)
is recommended for mass-production. Concluding, the author emphasizes the main
problems facing the rubber industry in this connection and he recommends: 1)
Modernization of testing machines, 2) modernizing instruments, 3) application
of small-sized samples for tensility and hardness tests, etc., 4) developing
effective methods for high-speed control of raw mixtures and rubbers in various
Card 8/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design for Mechanical Testing of Raw and Processed Rubbers

stages of continuous production, 5) increasing the output of the instruments and machines intended for testing on a large scale, 6) developing research for the study of mechanical properties of elastomers. To solve these problems it is recommended that there is more cooperation between the scientific research institutes and the laboratories in plants, and development of a special designing office and expanding the already existing base of industrial instrument design. There are 4 photographs, 1 diagram and 45 references: 34 are Soviet, 9 English, 1 French, 1 German.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti
(Scientific Research Institute of the Tire Industry)

Card 9/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design of Mechanical Testing of Raw
and Processed Rubbers

Fig. 3

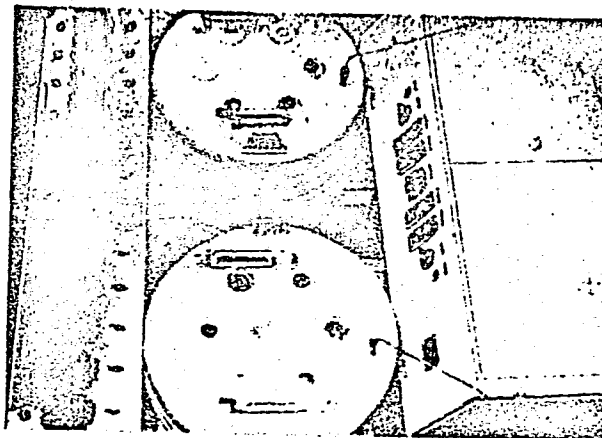Instrument for dynamic tests in sign-changing flexure (ZPI)

Card 10/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design of Mechanical Testing of Raw
and Processed Rubbers

Fig. 4

Stand for fatigue testing in
sign-changing flexure (SZPI)

Card 11/12

S/138/60/000/010/006/008
A051/A029

Problems of the Development of Instrument Design of Mechanical Testing of Raw
and Processed Rubbers
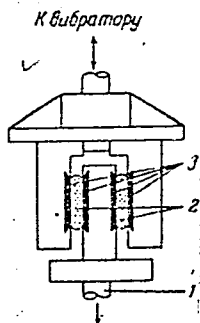
Fig. 5   *К вибратору*

Card 12/12

Diagram of an instrument for determining the
optimum vulcanization according to a dynamic
modulus:
1-force-measuring device; 2-samples; 3-plates of
the heater

REZN... (III.II)

USSR

13

DOGADKIH, B. A., and TARASOVA, Z. N., Moscow
Institute of Fine Chemical Technology imeni
M. V. Lomonosov /1961 position/- "Influence
of vulcanisation structures on physical and
mechanical properties of vulcanisates"
(Session II)

KUZ'MINSKIY, A. S., LYUBCHANSKAYA, L. I.,
FEL'DSHTEIN, L. S., Scientific Research Institute
of Rubber Industry, Moscow /1960 locations/-
"Influence of mechanical stresses on the ageing
of vulcanised rubbers" (Session VIII)

NOVIKOV, A. S., GILINSKAYA, N. S., DYUMAYEVA, T. N.,
GRIBACHEVA, A. V., NUDEL'MAN, Z. N., and
GALIL-OGLY, F. A., Scientific Research Institute
of Rubber Industry, Moscow /1961 locations/-
"Investigation of amine vulcanisation of
SKF-26 fluoroco-polymer" (Session II)

REZNIKOVSKIY, M. M., and BRODSKIY, G. I.,
Scientific Research Institute of Tire Industry,
Moscow - "Special features of the mechanism of
abrasion of high-elastic materials" (Session V)

report to be submitted for the 4th Rubber Technology Conference,
London, England, 22-25 May 1962.

S/138/62/000/002/008/009
A051/A126

AUTHOR: Reznikovskiy, M.M.

TITLE: Conference on friction wear

PERIODICAL: Kauchuk i rezina, no. 2, 1962, 49

TEXT: The All-Union Conference on Friction Wear of Rubber took place in
Moscow from December 11 - 14, 1961. It had been convened by the NIIShP of the
USSR State Committee, Council of Ministers on Chemistry; by the Department of
Rubber of the All-Union Chemical Society im. Mendeleyev and its First Organization
at NIIShP. Participants were representatives of scientific research institutes,
State Committee on Chemistry, USSR Council of Ministers, the Institute of Ma-
chine Design, Institute of High-Molecular Compounds at the AS USSR, the MGPI im.
Lenin, the Military Academy for Chemical Defense, tire and rubber plants. Em-
ployees of the NIIShP presented papers which demonstrated the applied signific-
ance of investigations into the mechanism of wear. The relative role played by
various forms of wear, such as abrasion, wear from repeated deformations, on the
irregularities of the friction surface followed by mechanico-chemical, thermo-
oxidizing changes in the rubber were pointed out. The use of new types of poly-

Card 1/3

S/138/62/000/002/008/009
A051/A126

Conference on friction wear

mers such as СКД(SKD), CKC-30-1 (SKS-30-1), СКД-1 (SKD-1), МВП (MVP), carbon
blacks [ХАФ(KhAF)-type, regal) resins, graphite; were shown to increase the
wear resistance of rubbers. It was pointed out that wear resistance could also
be increased by perfecting the constructional design of the articles. One paper
was dedicated to the investigation of frictional elements of certain designs.
The following papers dealt with new instruments and methods of laboratory tests:
"Testing Machine МИР-1 (MIR-1)" (NIIShP and the "Metallist Plant"), "Wear in the
Stream of the Abrasive Grain", "Oscillation of the Rubber Swing Along the Steel-
Grooved Drum" (VNIISK), "Method for Investigating Rubber Wear at High Rotational
Speeds" (NIIRP). Some papers dealt with: the use of radioactive isotopes for
evaluating tires under road conditions (NIIShP); method and instrument for stud-
ying the wear resistance of rubberized fabrics (Military Academy of Chemical De-
fense; topographical method for evaluating the service wear of footwear (NIIR);
The universal method used in the USSR for testing rubber wear, the ГОСТ426-57
(GOST 426-57) was found to be inadequate for rubber worn on relatively smooth
surfaces. A metal sieve, as a standard frictional material for this purpose was
recommended by the NIIPM (Sverdlovsk Branch of the NIIRP). The absence of ter-
minology was pointed out, and differences of opinion existing on the relative
role of various forms of surface destruction in friction, the role played by

Card 2/3

Conference on friction wear

S/138/62/000/002/008/009
A051/A126

chemical and mechanico-chemical transformations of rubber prior to its destruc-
tion, were discussed. Future problems of developing research and production of
rubber parts and their supply to the national economy were also discussed. Sim-
ilar conferences are to be held periodically.

Card 3/3

REZNIKOVSKIY, M.M.

/

/5.9300

AUTHORS: Lukomskaya, A.I.; Gudkova, L.F.; Merezhannyy, S.B.; Orlovskiy,
            P.N.; Reznikovskiy, M.M.

TITLE: Measurements of the sliding of rubber mixes on metal under various
            conditions

PERIODICAL: Kauchuk i rezina, no. 4, 1962, 21 - 25

TEXT: The Mooney type shifting viscosimeter with a biconical rotor was
used for studying the sliding phenomenon of rubber mixes on metal. The mathema-
tical analysis for calculating the characteristics of sliding, introduced by
Mooney, was applied, and the similarity of the two laws: viscous flow and ex-
ternal sliding of rubbers and rubber mixes was taken into account. Thus, meth-
ods for measuring the friction of rubber mixes against metal were developed: a)
on a biconical shifting viscosimeter, working under stable conditions of a given
rotational speed and pressure in the given tested material, using a smooth and a
rough rotor; b) on a special device for determining the friction coefficient,
working under non-stationary conditions of the given shifting load, sliding rate
and rate of application of the normal load. The coincidence of the friction co-

Card 1/2

Measurements of the sliding of rubber mixes on S/138/62/000/004/007/008
A051/A126

efficients of rubber mixes, determined under various testing conditions, is prov-
en. It is shown that rubber mixes can also be characterized by the same elevated
temperatures, at which adhering of the former to metal is greater than cohesion.
In this case, a cohesion destruction of the tested materials is noted during
testing and the results of the friction test correspond qualitatively to data ob-
tained when testing for adhesion and maximum flow in expansion. Obtained experi-
mental data show the possibility for measuring the sliding of rubber mixes along
metal under various conditions, and a connection between the condition indices.
A mathematical analysis is given. There are 4 figures and 3 tables. The refer-
ence to the most recent English-language publication reads as follows: M. Mooney,
International Rubber Conference, Washington, November 8 - 13, 1959.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scien-
               tific Research Institute of the Tire Industry)

Card 2/2

S/138/62/000/006/006/008
A051/A126

AUTHORS: Khromov, M.K., Reznikovskiy, M.M., Lazareva, K.N.

TITLE: Method of determining the rubber-cord strength of adhesion in
                repeated sign-changing deformations, expansion-compression

PERIODICAL: Kauchuk i rezina, no. 6, 1962, 27 - 31

TEXT: The authors developed the above method. The disadvantages of the
dynamic methods used now are: a) the impossibility of reproducing the working
conditions of the cord thread in tire elements; b) non-stable working conditions
of the sample and a decrease in accuracy and reproducibility of the tests. The
suggested method allows the tests to be conducted under stable conditions and
ensures good reproducibility of working conditions in the cord thread of the tire
casing elements. Fig. 1 is a diagram of the dumb-bell-shaped samples. During
the test the thick ends are placed in special detachable clamps. The upper clamp
is fastened in a fixed and the lower one in a movable cross-beam of the MPC -2
(MRS-2) machine. This way sign-constant and sign-changing symmetric expansion-
-compression deformations can be created. The compression deformations reached

Card 1/8

REZNIKOVSKIY, Mark Moiseyevich; LUKOMSKAYA, Aleksandra Il'inichna;
        ZUYEV, Yu.S., red.

        [Mechanical testing of crude and vulcanized rubber] Mekha-
        nicheskie ispytaniia kauchuka i reziny. Moskva, Khimiia,
        1964. 525 p.   (MIRA 18:2)

L 30094-65   EWT(m)/EPF(c)/EWP(j)   Pc-4/Pr-4   RM/GS

ACCESSION NR: AT5004099   S/0000/64/000/000/0095/0106

AUTHOR: Brodskiy, G.I.; Reznikovskiy, M.M.

TITLE: A study of the role of certain non-mechanical factors in the frictional wear of rubber

SOURCE: Nauchno-tekhnicheskoye soveshchaniye po friktsionnomu iznosu rezin, Moscow, 1961. Friktsionnyy iznos rezin (Frictional wear of rubber); sbornik statey. Moscow, Izd-vo Khimiya, 1964, 95-106

TOPIC TAGS: natural rubber, synthetic rubber, rubber wear, frictional wear, rubber abrasion, atmospheric oxygen, electrostatic charge, rubber filler, butadiene styrene rubber, antioxidant

ABSTRACT: The effect of abrasive surfaces, of atmospheric oxygen, and of electrical charges on the wear of natural and synthetic rubbers was determined experimentally in the presence and absence of fillers and inhibitors. Abrasive wear was measured against various surfaces on a Dunlop-Lemburn type tester with SKS 30-AM (70:30 butadiene-styrene copolymer) filled with 50% carbon black of various types. Abrasion of natural or synthetic rubbers was determined in air, nitrogen or argon, in the presence or absence of antioxidants and with various carbon black fillers. The electro-

Card 1/3

L 30094-65

ACCESSION NR: AT5004099

static potential of the specimen during wear tests on Grasseli or Dunlop-Lemburn type testers was measured with static voltmeters and the resistance of the rubber and the contact resistance between rubber and friction surface was determined with electrode pairs. Wear was also determined at various relative air humidities. Wear increased depending on the abrasive surface in the order smooth sheet metal, smooth poly-methylmethacrylate, hard rubber, profile steel, profiled polyvinyl chloride, and abra-sive paper-Monokorund 150; and it increased depending on the type of carbon black (50%) in the order KhAF, channel black, and lamp black. Abrasive wear of various rubbers depended on the oxygen content of the environment, decreasing in the order air, nitrogen (0.5% O₂), argon (0.05% O₂); the highest wear was measured in air with sodium-polymerized butadiene rubber, the lowest with butadiene-nitrile rubber (SKN-26); polyurethan and butyl rubber were little affected by the oxygen content of the atmosphere. The pure or combined antioxidants Santofleks AW, Neozon D, antiaging agent 4010, and

Flektol N decreased wear in the presence of 50% highly active carbon black such as channel black KhAF showed markedly less wear in air or nitrogen than specimens containing thermal or lamp black. Rubber SKS 30-AM containing 40% carbon black showed markedly improved wear resistance if the black was thermally pretreated at 700C or under 300 atm H_2 pressure at 300C. The

Card 2/3

L 30094-65

ACCESSION NR: AT5004099

electrostatic potential (ESP) generated during friction and wear was measured on natural rubber, SKS-30AM and SKB (Sodium catalyzed polybutadiene) and the ESP was shown to increase with rolling speed and to be much higher in rolling than in sliding friction. The results indicated, however, no direct correlation between ESP and wear or friction. No systematic difference in the wear of electrically insulated and grounded specimens was measured. Wear was also very little affected by relative humidity. The effect of the other studied conditions on wear indicated the need for close simulation of service conitions in testing of tires for wear. "N. L. Sakhnovskiy and T. N. Vinogradova selected the rubber formulation, while K. A. Pechkovskaya and I. P. Pavlova participated in the study of additive activity." Orig. art. has: 7 tables and 2 figures.

ASSOCIATION: none

SAKHNOVSKIY, N.L.; YEVSTRATOV, V.F.; ARENZON, N.M.; REZNIKOVSKIY, M.M.;
        GRIGOROVSKAYA, V.A.

    Some characteristics of the properties of tread rubber prepared
    from synthetic stereoregular butadiene rubber.   Kauch. i rez.
    22 no.12:14-21   D '63.   (MIRA 17:9)

    1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.

MALINCKIY, Yu.M.; RATNER, S.B.; REZNIKOVSKIY, M.M.; POLYAKOV, Yu.N.

Characteristics of polymer materials. Standartizatsiia 28 no.8:
23-28 Ag '64. (MIRA 17:11)

S/138/62/000/006/008/008
A051/A126

AUTHORS: Torner, R.V., Reznikovskiy, M.M.

TITLE: Meeting of the coordinating committee for instruments and methods
             of physico-mechanical tests

PERIODICAL: Kauchuk i rezina, no. 6, 1962, 59 - 60

TEXT: The meeting took place in February 1962. R.V. Torner spoke on meth-
ods of evaluating the technologies of raw rubber and non-vulcanized rubbers. He
discussed: a) the condition of rapid control; b) determination of rheolic charac-
teristics, necessary for the analysis of technological processes and for determin-
ing the equipment; c) state of the production check of rubber mixes in industrial
rubber plants. It was recommended to use the more accurate shifting-type rotating
instruments for rubber mix control. In 1959, НИИШП (NIIShP) ordered a viscosi-
meter. The BP-2 (VR-2) was manufactured in the "Metallist" Plant according to
the design by Rezinoproyekt. Owing to its unsatisfactory functioning the follow-
ing recommendations were made: a) in 1962, the NIIShP, in cooperation with the
"Metallist" Plant, is to improve the design of the plastomer, for increasing accu-

Card 1/3

S/138/62/000/006/008/008
A051/A126

Meeting of the .....

racy and reliability of the instrument. By 1963, mass production of the VR-2, equipped with an attachment for registering the torsional moment should be possible; b) during the period 1962-1963, the "Metallist" Plant is to complete the instruments manufactured in 1959 with parts and attachments, as recommended by the NIIShP; c) the plants are to pledge start of production 6 months after receiving the additional parts. A seminary should be organized at NIIShP for exchanging experiences on the VR-2; d) the NIIShP, ВНИИСК (VNIISK), НИИРП (NIIRP) and the НИИР (NIIR) are to be held responsible for the correct functioning of the VR-2 instrument. The meeting further recommended that: 1) the NIIShP, in cooperation with the НИИКИМП (NIIKIMP the Scientific Research Institute of Machine and Instrument Design), develop and test a model of express-plastomers in 1962, of the shifting type, with a time for the determination of plasticity duration, of not more than 1 minute, and test the possibility of determining the vulcanizability of the mix using the same model; 2) the NIIR should resume the study of determining the vulcanizability of mixes on the vulcameter; 3) suggest an experimental-industrial instrument for rapid-control, on the basis of tests performed on the two models prior to January 1963; 4) perform tests on industrial samples not later than August-September, 1963 and prepare suggestions for the organization of a series

Card 2/3

Meeting of the...

S/138/62/000/006/008/008
A051/A126

production of rapid-control instruments by 1964. Finally, the meeting suggested
creating uniform methods for testing and building instruments. They recommended:
1) to make the NIIShP responsible for conducting tests on existing rotational and
capillary viscosimeters, on uniform-model systems according to a unitary program,
together with interested organizations; 2) to select the main design of the
instrument from results of tests, and develop technological requirements in the
design by 1963, with respect to the experimental-industrial viscosimeter, for use
in determining the rheolic characteristics of raw and synthetic rubbers; 3) the
NIIKIMP and the NIIShP are to ensure production and testing of the experimental-
-industrial viscosimeter and recommend a means for organizing the series produc-
tion of the latter no later than by 1965.

Card 3/3

Effect of testing conditions on the extent of S/138/62/000/009/001/002
A051/A126

$$\tau = G\gamma_2 + \eta \frac{d\gamma_2}{dt} = \eta_3 \frac{d\gamma_3}{dt} , \qquad (2)$$

where γ_2 and γ_3 are the elastic and viscous deformations, respectively. Under compression and expansion, at a constant volume during deformation, deformation ε and tension σ are determined by a relation similar to (2). The elastic deformation γ_2 is:

$$\gamma_2 = \frac{\eta_3}{G} \times B \left(1 - e^{-\frac{G}{\eta_3 + \eta} t} \right) , \qquad (3)$$

under conditions of a given rate of shear deformation $d\gamma/dt = B = $ const. reached on a shear plastomer, under non-stationary conditions. When using the Williams-type plastomer under a given compressive load F, at standard duration of compression and recovery and at above-mentioned changes of parameters G, η and η_3, the elastic recovery depends little on the filler content. Using Mooney-type shear plastomers at a given rate of deformation, the elastic recovery drops with an increase in the filler content. Computed data on the nature

Card 2/3

Effect of testing conditions on the extent of S/138/62/000/009/001/002
                                                         A051/A126

of elastic recovery changes, according to filler content and depending on the
testing conditions, were found to coincide with experimental findings from tests
on plastomers of the Williams and Mooney types. The data obtained also show the
importance of the selected testing conditions for determining the plasto-elastic
properties. There are 3 figures.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scien-
              tific Research Institute of the Tire Industry)

Card 3/3

L 35040-65   EWT(m)/EPF(c)/EWP(j)   Pc-4/Pr-4   RM/GS

S/0000/64/000/000/0021/0030

ACCESSION NR: AT5004094

25
B+/

AUTHOR: Reznikovskiy, M. M.; Brodskiy, G. I.

TITLE: Characteristics of the wear mechanism of highly elastic materials

SOURCE: Nauchno-tekhnicheskoye soveshchaniye po friktsionnomu iznosu rezin.
Moscow, 1961. Friktsionnyy iznos rezin (Frictional wear of rubber); sbornik
statey. Moscow, Izd-vo Khimiya, 1964, 21-30

TOPIC TAGS: rubber, rubber research, wear resistance, rubber property

ABSTRACT: The wear mechanism in rubber is a complex process which depends on the
combination of conditions which are characteristic of the operation at the point
of friction. The basic problem in this study was separate consideration of the
most characteristic mechanisms which correspond to the most important limiting con-
ditions. Photomicrographs of three characteristic types of surface wear in rubber
are given: abrasive wear, fatigue wear, and wear by rolling. The third type of
wear results from the destruction of the surface layer of rubber by multiple de-
formations of surface irregularities. This type of wear is characteristic of
highly elastic materials and does not occur with solids. Orig. art. has: 5 fig-
ures, 2 tables and 3 formulas.

Card 1/K1

L 37029-65   EWT(m)/EPF(o)/EWP(v)/EPR/EWP(j)/T   Pc-4/Pr-4/Ps-4   RM/WW

ACCESSION NR: AP4030792   8/0020/64/155/004/0924/0926

AUTHOR: Reznikovskiy, M. M.; Kamenskiy, B. Z.

TITLE: On the variation of adhesive strength with time in cemented rubber

SOURCE: AN SSSR. Doklady, v. 155, no. 4, 1964, 924-926

TOPIC TAGS: adhesive bonding, rubber adhesive, surface diffusion, vulcanized
rubber

ABSTRACT: Diffusion theory is contrasted with surface interaction theory to ex-
plain polymer adhesion. In the general case of contact between inelastic bodies,
the area of the molecular binding zones depends on the duration of the contact
pressure. The surface interaction theory may also be used in explaining the gene-
ral character of the relationship between strength of the bond and duration of
clamping. When polymers are cemented, both the kinetics of Mackian elasticity
and viscous flow are responsible for the development of surface contact under the
action of the clamping load. From the standpoint of the diffusion theory, the
basic form of molecular motion is the micro-Brownian movement of the components,
whereas in the process of contact formation more consideration should be given to
the development of plastic deformations caused by macro-Brownian movement. Poly-

Card 1/4

L-37029-65
ACCESSION NR: AP4030792

mers adhere mainly in the viscous state, which contradicts the diffusion theory. The part played by the development of plastic deformations and diffusion in the cementing process may be evaluated by comparing the kinetic adhesion relationships when polymer specimens are cemented in which the surfaces making contact differ in roughness. Kinetic relationships were compared for the adhesion strength between raw rubber stock and vulcanized rubber with smooth and rough surfaces. It was found that the tearing strength for vulcanized specimens with a smooth surface is much less dependent on the clamping time than for those with a rough surface. Data on the effect of "aging" the cemented samples before testing them are given in Fig. 1 of the Enclosure. This experiment shows no increase in the strength of bond as should be expected from the diffusion theory since diffusion processes continue over a period of time. Thus tests made on the cementing of raw and vulcanized rubber contradict the diffusion nature of the adhesion bond. In this case, the kinetic relationship of the adhesion strength is determined by the increase in the contact surface for the materials being cemented. This increase is caused by pastic deformations in the viscoelastic adhesive.

Card 2/4

L 37029-65
ACCESSION NR: AP4030792

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry)

SUBMITTED: 15Nov63   ENCL: 01   SUB CODE: MT, GC

NO REF SOV: 003   OTHER: 001

Card 3/4

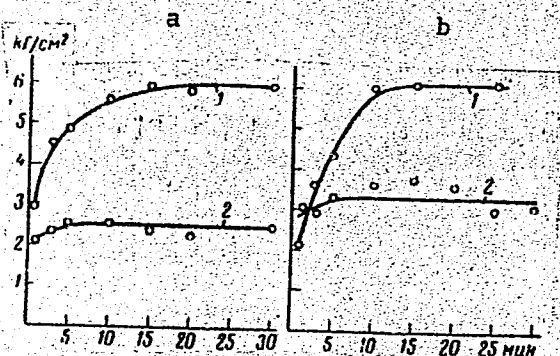L 37 29-65
ACCESSION NR: AP4030792

a   b   ENCLOSURE: 01

Fig. 1. Bonding strength between BSK vulcanized rubber and SKB rubber as a function of contact duration. 1--under a load of 12 kg/cm²; 2--load removed one minute after cementing.

Card 4/4

REZNIKOVSKIY, M.M.; LUKOMSKAYA, A.I.; PANIN, G.F.; KALINOVA, L.T.

Practical variant of a method determining the characteristic
energy of rubber stripping. Kauch. i rez. 24 no.11:26-29 '65.
(MIRA 19:1)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.

L 20408-66   EWT(m)/EWP(j)/T   RM
ACC NR: AP6008404   (A)   SOURCE CODE: UR/0374/66/000/001/0082/0086

AUTHOR: Zhbakov, B. I.; Lukomskaya, A. I.; Reznikovskiy, M. M.

ORG: Scientific-Research Institute of the Tire Industry, Moscow (Nauchno-issledovatel'skiy institut shinnoy promyshlennosti)

TITLE: Certain peculiarities of the strength properties of crystallizing rubbers under increased temperature

SOURCE: Mekhanika polimerov, no. 1, 1966, 82-86

TOPIC TAGS: synthetic rubber, tensile strength, crystallization, thermomechanical property, physical chemistry property, vulcanization

ABSTRACT: Causes of the scattering of tensile strength values at 100C for crystallizing rubber test pieces were investigated. The dependence of the strength distribution on the rate of vulcanization was explained. The previous history of the heat treatment of crystallized rubber has a strong effect on the strength properties of vulcanized rubber. Orig. art. has: 5 figures. [Based on authors' abstract.]
[NT]

SUB CODE: 11/   SUBM DATE: 23Feb65/   ORIG REF: 002/

Card   1/1 LK   UDC: 678:43.01.539.4

KRAGEL'SKIY, I.V.; REZNIKOVSKIY, M.M.; BRODSKIY, G.I.; NEPOMNYASHCHIY, Ye.F.

Friction-contact fatigue of high-elasticity materials. Kauch. i rez.
24 no.9:30-34 '65.   (MIRA 18:10)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti i
Gosudarstvennyy nauchno-issledovatel'skiy institut mashinovedeniya.

L 4283-66   EWT(d)/EWT(m)/EPF(c)/EWP(v)/EWP(j)/EWP(k)/EWP(h)/T/EWP(l)   RM/DJ
ACCESSION NR: AP5024107   UR/0138/65/000/009/0030/0034
                                     678.063:539.431

AUTHOR: Kragel'skiy, I. V.; Reznikovskiy, M. M.; Brodskiy, G. I.; Nepomnyashchiy, Ye. F.

TITLE: Friction-contact fatigue of highly elastic materials

SOURCE: Kauchuk i rezina, no. 9, 1965, 30-34

TOPIC TAGS: rubber, fatigue test, mechanical fatigue, friction, test instrumentation

ABSTRACT: An experimental study of the contact fatigue of rubbers was carried out at
the IMASh with a "Tsiklometr" instrument and at the NIIShP with a "PUPS" instrument.
Both of these instruments and their operation are described. To establish the behavior of
the friction-contact fatigue of rubbers, use was made of the elementary model of friction,
consisting of a spherical indenter which simulates a projection of a rough surface and
repeatedly deforms the rubber surface. Curves of contact fatigue were obtained for
tread rubbers based on SKB, NK, Europrene, and an uncompounded NK-base rubber.
The contact and volume fatigue were found to behave in similar fashion; in both cases, the
fatigue resistance coefficients were similar. A comparison of the curves of the volume

Card 1/2

L 4283-66

ACCESSION NR: AP5024107

and friction-contact fatigue leads to the conclusion that in friction-contact fatigue, the breaking stress is the tensile stress of the surface layer due to the frictional force. The data obtained confirm the relationship between the wear resistance of rubber and its fatigue resistance. Orig. art. has: 6 figures and 2 formulas.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry); Gosudarstvennyy nauchno-issledovatel'skiy institut mashinovedeniya (State Scientific Research Institute of Machine Science)

SUBMITTED: 00   ENCL: 00   SUB CODE: MT

NO REF SOV: 009   OTHER: 002

Card 2/2

REZNIKOVSKIY, M.M.; Prinimala uchastiye LAZAREVA, K.N.

Durability of highly elastic polymers. Dokl. AN SSSR 162 no.1:140-143 My '65. (MIRA 18:5)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
Submitted October 10, 1964.

REZNIKOVSKIY, M.M.; LAZAREVA, K.N.

Quantitative characteristics of rubber fatigue in case of an asymmetric load cycle. Kauch. i rez. 23 no.7:32-36 Jl '64.
(MIRA 17:8)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.

L 40563-65   EWT(m)/EPF(c)/EWP(j)/T   Pc-4/Pr-4   GS/RM
                                        S/0000/64/000/000/0183/0191   28
ACCESSION NR: AT5004104   B+/

AUTHOR: Reznikovskiy, M. M.; Goloskov, E. I.; Atlas, B. N.; Shcherbach, Z. V.;
Brodskiy, G. I.; Merezhannyy, S. B.

TITLE: New abrasion tester for rubber under rolling contact

SOURCE: Nauchno-tekhnicheskoye soveshchaniye po friktsionnomu iznosu rezin. Mos-
cow, 1961. Friktsionnyy iznos rezin (Frictional wear of rubber); sbornik statey.
Moscow, Izd-vo Khimiya, 1964, 183-191

TOPIC TAGS: rubber wear, rubber abrasion, frictional wear, abrasion tester

ABSTRACT: An abrasion tester for rubber under rolling contact with controlled
slippage on renewable abrasive surfaces and its application are described. The
apparatus was developed in the NII shinnoy promyshlennosti (Tire industry scienti-
fic research institute). A rotating ring-shaped specimen of 50 mm outer diameter
drives an abrasive drum by friction contact, and the slippage of the contact zone
is controlled by the brake force applied to the drum as shown in Fig. 1 of the En-
closure. Samples are prepared by vulcanization in a special form and they are
tested at a given slippage S and given friction force, F, at given slippage and

Card 1/4

L 40563-65
ACCESSION NR: AT5004104

given load N on the specimen, or at given friction force and given load. The test-
ing procedure is described in detail. A formula is given for preparing a standard
vulcanizate, used for testing the abrasive capacity of the renewable friction sur-
face. Wear is calculated by presented equations from measured values as volumet-
ric loss or as the ratio of volumetric loss to the work (kilowatt-hr.) required to
produce the wear. Orig. art. has: 2 figures and 5 formulas.

ASSOCIATION: None

SUBMITTED: 05Aug64

ENCL: 02

SUB CODE: MT, IE

NO REF SOV: 000

OTHER: 000

Card 2/4

ACCESSION NR: AP4043973   S/0138/64/000/008/0035/0040

AUTHOR: Kamenskiy, B. Z., Vostroknutov, Ye. G., Reznikovskiy, M. M.

TITLE: Effect of the surface state and bonding conditions on the bond strength between vulcanized and unvulcanized rubbers

SOURCE: Kauchuk i rezina, no. 8, 1964, 35-40

TOPIC TAGS: rubber, vulcanization, aging, adhesion, bonding, bond strength, contact surface, rubber surface

ABSTRACT: The effect of aging of the vulcanizates on the bond strength between vulcanized and unvulcanized rubber mixtures from NK was studied before and after vulcanization of the bonded samples and with or without roughening of the vulcanized surface. The results shown in the Enclosure demonstrate the importance of mechanical surface treatment to remove the oxidized layer. Aging, on the other hand, had an unfavorable effect on the bond strength of vulcanized rubber. Pictures of surfaces processed by different methods are shown and their effect on the bond strength is evaluated. Since an increase in contact area increases the bond strength, the possibility of increasing the surface area by mechanical treatment is studied for different types of geometric relief. The concept of "order of roughening" is developed and it is shown that for each type of relief, the true

Card 1/3

ACCESSION NR: AP4043973

(geometrical) contact area can be determined by simple calculations using Maxwell's equation. The coefficients of increase in geometrical surface area are given for different models and formulas are developed for determining the coefficient of true contact area. This coefficient is a complicated function of time and normal load. Finally, the dependence of bond strength between vulcanized and unvulcanized rubbers on the amount of pressure (for 3 min.) and on bonding time (at 12 atm.) is plotted. The expression calculated for this relationship makes it possible to describe the experimental data approximately without using the theory of layer-to-layer molecular diffusion. Orig. art. has: 7 formulas and 6 figures.

ASSOCIATION: Nauchno issledovatel'skiy institut shinnoy promyshlennosti (Scientific Research Institute of the Tire Industry)

SUBMITTED: 00

SUB CODE: MT

ENCL: 01

NO REF SOV: 007

OTHER: 000

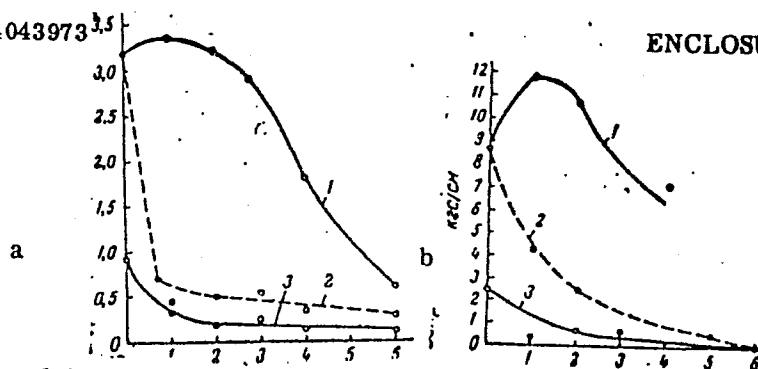Card 2/3

ACCESSION NR: AP4043973

ENCLOSURE: 01

Fig. 1. Effect of aging of the vulcanizate on its bonding strength with an unvulcanized
        rubber mixture of NK, before (a) and after (b) vulcanization of the bonded
        samples: 1 - roughening of the vulcanizate surface after aging; 2 - roughening
        of the vulcanizate surface before aging; 3 - without roughening of the vul-
        canizate surface. Ordinate = bond strength in kg.s/cm; abscissa = aging time
        in days.

Card 3/3

ACCESSION NR: AP4010253   S/0138/63/000/012/0014/0021

AUTHORS: Sakhnovskiy, N. L.; Yevstratov, V. F.; Arenzon, N. M.; Reznikovskiy, M. M.; Grigorovskaya, V. A.

TITLE: Some peculiar properties of protective rubbers from stereoregular butadiene rubber SKD

SOURCE: Kauchuk i rezina, no. 12, 1963, 14-21

TOPIC TAGS: rubber, stereoregular rubber, butadiene rubber, polymer, SKD rubber, plasticity, physicochemical properties, BSK rubber, wear, fatigue, abrasive wear, thermo oxidative resistance, deformation

ABSTRACT: Protective rubbers from 100% SKD, vulcanized for 50 minutes at 143C, were rated below natural rubber and BSK rubber, but possessed satisfactory heat resistance. Combinations with other rubbers, especially with isoprene rubbers in a 1:1 ratio, result in superior strength, but lower the heat resistance. At room temperature SKD rubbers surpass natural rubber in elasticity, but at 100C the trend is reversed. While being listed below natural rubber in resistance to expansion of cracks, the SKD rubber showed in road tests a high resistance to crack formation. Unfilled SKD protective rubbers proved superior to natural rubber and BSK

Card 1/2

ACCESSION NR: AP4010253

(europrene) rubber in resistance to wear, which is to a large extent attributed to a low coefficient of surface friction. It was found that SKD rubbers possessed a high degree of resistance to thermo-oxidative processes associated with abrasion, as well as with thermal aging. The destruction of the surface layer of SKD rubber sets in after a far greater number of deformation cycles as compared with natural rubber. It is concluded that under severe test conditions protective vulcanizates from SKD rubber would offer great advantages over compounds on the base of natural and BSK rubbers. Orig. art. has: 6 tables, 2 charts, and 2 pictures.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promy*shlennosti (Scientific Research Institute of the Tire Industry)

SUBMITTED: 00   DATE ACQ: 03Feb64   ENCL: 00

SUB CODE: CH   NO REF SOV: 005   OTHER: 006

Card 2/2

REZNIKOVSKIY, M.M.; ZHBAKOV, B.I.; PANIN, G.F.

Redesigned tearing test machine with a thermal chamber. Kauch.i
rez. 22 no.1:51-54 Ja '63.   (MIRA 16:6)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
                              (Rubber—Testing)

L 14409-63   EWP(j)/EWT(m)/BDS   AFFTC/ASD   Pc-4   RM

ACCESSION NR: AP3003289   S/0138/63/000/006/0020/0026

AUTHORS: Sakhnovskiy, N. L.; Reznikovskiy, M. M.; Yevstratov, V. F.; Brodskiy, G. I.

TITLE: Effect of vulcanized rubber coatings and of test types on the type and amount of wear

SOURCE: Kauchuk i rezina, no. 6, 1963, 20-26

TOPIC TAGS: vulcanized rubber, abrasion, wear

ABSTRACT: In the present investigation various types of wear in car and truck tires were studied under road conditions and by testing machines. The findings were correlated with the kind of stock used for tire tread, supplemented by microscopic analysis of tread sections. It was found that on modern class A roads under stand-ard speeds and loads the tread was wearing off after approximately 20 000 revolutions of the wheel, the surface of the tire being smooth and showing the so-called fatigue-type wear. On class B roads, on the other hand, the abrasive type of wear became predominant, while the presence of 1% sharp curves increased the wear fourfold. Other types of wear were also studied, and the relationship of the type and rate of wear of protective stock to the modulus and tensile and tear resistance

Card 1/2

L 14409-63
ACCESSION NR: AP3003289

charted. Experimental evidence was obtained that tear and wear causes an intensive
destruction of the molecules of natural rubber, as evidenced by a 2.4 times increase
in solubility in chloroform after 72 hours storage at 100C, and a tenfold increase
following rubbing against a concrete surface for the same duration. Since the
internal temperature in this case was 40C, it was concluded that the change in
solubility was due to mechano-chemical destruction of the polymer. Further support
of this point of view was obtained by subjecting natural rubber three times to a
450% stretch, which resulted in a sharply lowered hardness and resistance to tear.
Orig. paper has: 7 figures and 3 tables.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promy*shlennosti (Scien-
tific Research Institute of the Tire Industry)

| SUBMITTED: 00 | DATE ACQ: 10Jul63 | ENCL: 00 |
| SUB CODE: MA | NO REF SOV: 005 | OTHER: 007 |

Card 2/2

GUDKOVA, L.F.; LUKOMSKAYA, A.I.; REZNIKOVSKIY, M.M.

Effect of the testing conditions on the value of the elastic
recovery of rubber compounds. Kauch.i rez. 21 no.9:17-21
S '62.   (MIRA 15:11)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.
        (Rubber—Elastic properties)

MIRONOV, N.A.; LAZAREVA, K.N.; RE...NOVSK..., N...

Effect of oxygen content of the environment on the fatigue life of rubbers. Kauch. i rez. 22 no.9:9-12 S '63.   (MIRA 16:11)

1. Nauchno-issledovatel'skiy institut shinnoy promyshlennosti.

S/138/63/000/003/005/008
A051/A126

AUTHORS: Reznikovskiy, M. M., Lazareva, K. N.

TITLE: The quantitative characteristic of rubber fatigue under a sym-
                metric load cycle

PERIODICAL: Kauchuk i rezina, no. 3, 1963, 17 - 20

TEXT: A physical definition of the fatigue concept under a dynamic load
is given and general recommendations are made on the quantitative characteristic
of dynamic fatigue of rubbers in a symmetric cycle. Physical criteria of rubber
fatigue which could be used for a general and universal methodical approach to
a quantitative evaluation of this property are established. A general relation
between stress and resistance in a symmetrical load cycle is found for amplitude
values of deformation below 30%. The rubber resistance under dynamic loads de-
pends on two factors of its mechanical properties: the tensility under a single
load and the dimensionless coefficient β characterizing the relation between the
resistance and the repeated load. The physical determination of the dynamic fa-
tigue of rubber, as a sensitivity factor of its resistance to a repeated load

Card 1/2

The quantitative characteristic of rubber fatigue...   S/138/63/000/003/005/008
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and a quantitative characteristic of this fatigue is made possible by using β. $\overset{\beta}{\beta}$ is called the fatigue coefficient of rubber resistance. There are 3 figures and 1 table.

ASSOCIATION: Nauchno-issledovatel'skiy institut shinnoy promyshlennosti
            (Scientific Research Institute of the Tire Industry)

Card 2/2

L 23530-66   EWP(j)/EWP(k)/EWT(d)/EWT(m)/EWP(l)/EWP(v)/EWP(h)   IJP(c)   RM

ACC NR: AP6007857   SOURCE CODE: UR/0138/66/000/002/0046/0047

AUTHOR: Reznikovskiy, M. M.; Bukhov, S. I.

ORG: Scientific Research Institute for the Tire Industry (Nauchno-issledovatel'skiy institut shinnoy promyshlennosti)

TITLE: Apparatus for testing the ozone resistance of rubber under natural conditions

SOURCE: Kauchuk i rezina, no. 2, 1966, 46-47

TOPIC TAGS: mechanical measuring tool, elastic deformation, ozone, rubber, crack propagation

ABSTRACT: An apparatus for the simultaneous testing of the ozone resistance of 100 samples was devised at the Scientific Research Institute for the Tire Industry. It consists (see Fig.) of a welded base frame 5 on which are mounted a welded cross-piece 4, internal and external plates 1 and 2 for fixing the fasteners 6 with the samples, an electric motor 8 (0.25 kw at 1400 rpm), and a transmission 7. The samples prepared according to State Instructions GOST 270-64, are fastened onto the plates of the apparatus. The external plates have a rotating movement only, whereas the internal plates rotate and displace simultaneously due to the excentric: the rolls which are attached to the ends of the plates rotate along the grooves of the excentric. The rotation of the crosspiece by 180° displaces the internal plates by 7mm. This
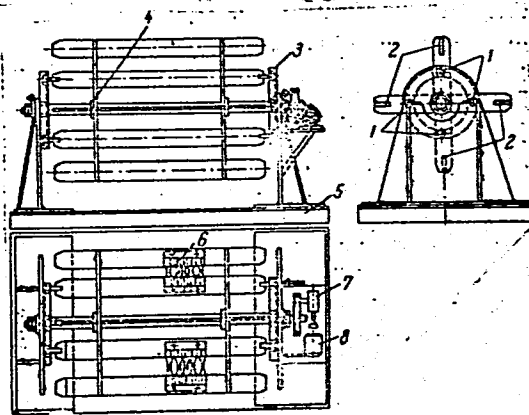
Card 1/2   UDC: 678.05:620.1.05:620.193

L 23530-66

ACC NR: AP6007857   1

affects a deformation $\varepsilon_{max} = 28\%$ under static deformation $\varepsilon_{min} = 8\%$. Then,
$\bar{\varepsilon} = \frac{\varepsilon_{max} + \varepsilon_{min}}{2} = 18\%$ and $\varepsilon_0 = \frac{\varepsilon_{max} - \varepsilon_{min}}{2} = 10\%$, where $\bar{\varepsilon}$ is a mean component

of deformation, and ε_0 is an amplitude of dynamic deformation. The frequency of
dynamic deformation is controlled by the rate crosspiece rotation (10 rpm) effected
by the electric motor 8 through the transmission 7. This frequency permits a visual
observation of the appearance and growth of cracks on the surface of the sampels. The
value of dynamic deformation can be controlled by changing the excentricity of the
apparatus. Orig. art. has: 1 fig.
SUB CODE: 13,11/ Subm Date: 22Jul64
Card 2/2

S/138/63/000/001/005/008
A051/A126

AUTHORS: Reznikovskiy, M. M., Zhbakov, B. I., Panin, G. F.

TITLE: Reconstructed rupturing machine with a heat chamber

PERIODICAL: Kauchuk i rezina, no. 1, 1963, 51 - 55

TEXT: The disadvantages of the PMM-60A (RMM-60A) rupturing machine with a KH-150 (KN-150) heat chamber, used for thermal-resistance testing of rubber, are given: a) the dynamometer gives exact measuring results only for forces exceeding 3 kgf, and in most rubber types, the force, corresponding to 100 - 200% deforma-, tions at room temperature does usually not exceed 3 kgf. With an increase in tem-perature, there is a tendency to a tension drop at a given deformation; b) force measuring errors are introduced by the force transmission system from the sample in the heat chamber to the dynamometer; c) the direct measuring of the useful section by scale ruler or manually shifting the indices is awkward and inaccura-te owing to its subjectivity. The НИИШП (NIIShP) laboratory of physico-mechan-ical measurements has eliminated these shortcomings by developing new units and parts for the above-mentioned machines. An additional indicator dynamometer,

Card 1/2

Reconstructed rupturing machine with a heat chamber   S/138/63/000/001/005/008
                                                          A051/A126

designed for a maximum force of 7 kgf, has been introduced for measuring forces at low sample deformations. The dynamometer is connected consecutively to the pendulum dynamometer. The indicator used is manufactured by the Kirov plant "Krasnyy Instrumental'shchik". Friction joints are eliminated. The extensometer for measuring the elongation of the useful sample section, for thermal resistance testing in the thermal chamber, has been improved. The construction of the machine can be carried out in any laboratory. Its two main advantages are: 1) increased accuracy of force-measurement, including that of low values; 2) automation of elongation measurement and determination of tensions at fixed deformations (100, 200%, etc). There are 4 figures, 1 table.

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             (Scientific Research Institute of the Tire Industry)

Card 2/2

S/081/61/000/021/089/094
B107/B147

AUTHORS: Khromov, M. K., Priss, L. S., Reznikovskiy, M. N.

TITLE: Further investigation of methodic problems in the field of
             rubber fatigue tests

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 21, 1961, 465, abstract
             21P174 (Tr. N.-i. in-ta shin. prom-sti, sb. 7, 1960, 5-20)

TEXT: The authors describe a number of new methods and give recommenda-
tions for rubber fatigue tests. On a special device, rubbers were tested
in various gas media by an alternating torsion-bending test. In nitrogen
(0.3 - 0.5% O_2) as compared with air, the working capacity rises for
НK(NK) rubber to the 3-4 fold, СKИ(SKI) and СKC-30АМ (SKS-30AM) to the
2-3 fold, and СKБ(SKB) by 25-30%. Bending fatigue tests showed different
sensitivities to stress concentrations for rubber of different composi-
tions. These concentrations were produced by notches of different depths.
Among the rubbers mentioned, NK showed the highest, SKB the lowest
stability to the growth of the notch. Dumbbell samples were used for
testing rubbers for fatigue under alternating dilatation compression.
Card 1/2